

REMARKS

Claims 1, 17 to 22 and 27 to 30 are all the claims pending in the application.

Claims 29 and 30 have been rejected under the first paragraph of 35 U.S.C. § 112 as failing to comply with the written description requirement.

The Examiner states that the amended claims 29 and 30 recite a diameter range of 100 to 300 nm, but there is no support for such a range. The Examiner states that it appears from the original disclosure that the range should be 10 nm to 100 nm.

Applicants submit that the presently recited diameter range of 100 to 300 nm in claims 29 and 30 finds support in the specification, in accordance with relevant case law. Applicants have amended independent claims 1, 17, 21, 22 and 28 to also recite this range.

Applicants submit that the recited diameter range of 100-300 nm finds support in the specification, in accordance with the decision in *In re Wertheim*, 191 USPQ 90, 98 (CCPA 1976)). In *Wertheim*, the ranges described in the original specification included a range of “25%-60%” and specific examples of “36%” and “50%.” According to the *Wertheim* court, a corresponding new claim limitation to “between 35% and 60%” met the description requirement because persons skilled in the art would consider employing a 35-60% solids content range as part of appellants’ invention.

In the present case, the original specification describes a range of “1 to 300 nm” for the VGCF filament diameter at, for example, page 19, lines 11-16, and a specific example of 100 nm in Example 5 on page 28, line 2. Thus, in the present case, not only are applicants choosing an endpoint for the recited range based on an example, the recited endpoint of 100 nm is the exact value described in the example, rather than merely being close to the value described in the

example, as was the case in *Wertheim*. Accordingly, it is clear that a person of ordinary skill in the art would consider a VGCF filament diameter range of 100 to 300 nm as part of applicants' invention.

In view of the above, applicants submit that the claims comply with the requirements of the first paragraph of 35 U.S.C. § 112 and, accordingly, request withdrawal of this rejection.

Claims 1, 17, 18, 21, 22 and 27-30 have been rejected under 35 U.S.C. § 102(e) as anticipated by the newly cited U.S. Patent 6,780,388 to Masuko et al.

Applicants submit that Masuko et al do not disclose the subject matter of the above claims and, accordingly, request withdrawal of this rejection.

The Examiner states that Masuko et al disclose an electrode including a catalyst layer and a gas diffusion layer.

The Examiner asserts, among other things, that Masuko et al disclose that each gas diffusion layer includes a hydrophobic resin (polytetrafluoroethylene), as disclosed at column 11, lines 1-10, and carbon fibers.

The Examiner further states that Masuko et al disclose a catalyst layer, including the boundary between the catalyst layer and gas diffusion layer, that includes conductive particles such as carbon black, which is applied to electrodes in the form of a paste. The Examiner states that since the gas diffusion electrode is porous, at least a portion of the catalyst paste will penetrate the boundary between the gas diffusion layer and the catalyst paste layer.

The Masuko et al patent discloses a polymer electrolyte fuel cell that contains a gas diffusion layer comprising a carbon sheet treated with a water repellant polytetrafluoroethylene resin, a catalyst layer, and an ion exchange membrane.

The catalyst layer can be comprised of a powder for supporting a platinum catalyst. The powder on which the catalyst is supported can be carbon black or can be a composite powder comprised of carbon black and vapor grown carbon fiber (VGCF). See, for example, column 10, lines 43-57. The catalyst layer can contain a fluorine-type ion exchange resin and a water repellant resin. The carbon sheet for the gas diffusion layer can be an SCT sheet produced by Showa Denko K.K., as disclosed in the Examples. See column 14, lines 64-65.

The present claims recite an electrode comprised of a catalyst layer and a gas diffusion layer, wherein the gas diffusion layer comprises a layer containing a water repellant resin and a fibrous carbon formed through heat treatment at a temperature of at least 2000°C, and wherein the fibrous carbon has a fiber filament length of 100 μ m or less and a fiber filament diameter of 100 to 300 nm.

In Masuko et al, the gas diffusion layer comprises the carbon sheet treated with water repellant polytetrafluoroethylene resin. This gas diffusion layer does not satisfy the requirement of the fibrous carbon set forth in the claims.

As noted above, the gas diffusion layer in Masuko et al is comprised of an SCT carbon sheet. Masuko et al do not provide any specifics concerning the sheet, except to say that it is produced by Showa Denko K.K. Showa Denko K.K. is the assignee of the present application. This SCT carbon sheet of Showa Denko is not made from a fibrous carbon that satisfies the present claims.

In particular, an SCT carbon sheet is a carbon sheet produced by carbonizing paper, which therefore does not contain a carbon fiber with a diameter of 100 to 300 nm.

The VGCF in Masuko et al is a fibrous carbon that satisfies the present claims, but this fibrous carbon is employed in the catalyst layer of Masuko et al, and not in the gas diffusion layer.

The Examiner asserts that the gas diffusion electrode of Masuko et al is porous and at least a portion of the catalyst paste will penetrate the boundary between the gas diffusion layer and catalyst paste layer. Since the catalyst paste layer in Masuko et al contains fibrous carbon that satisfies the recitation of the claims, it appears that the Examiner may be arguing that the fibrous carbon in the catalyst layer penetrates the gas diffusion layer and, therefore, the gas diffusion layer can be considered to be made of the fibrous carbon.

In response, applicants point out that Masuko et al disclose a catalyst layer comprising VGCFs, in which catalyst layer a platinum catalyst is supported on the VGCFs.

In contrast, the present invention relates to a gas diffusion layer in which a platinum catalyst is not supported on the VGCFs of the gas diffusion layer.

Although the Examiner alleged that "since the gas diffusion electrode is porous, at least a portion of the catalyst paste layer will penetrate the boundary between the gas diffusion layers and the catalyst layer," even if the allegation is accepted, the structure of the VGCFs in the resulting gas diffusion layer of the Examiner's allegation is different from that of the present invention, since the fibrous carbon of the present invention in the gas diffusion layer is substantially free of platinum. See, for example, Example 5, where platinum serving as a catalyst was applied to a carbon black (Ketjen Black) that was employed in a slurry that was applied to an ion-exchange membrane. In Example 5, a gas diffusion sheet including a gas diffusion layer comprised of fibrous carbon was prepared without any catalyst.

With respect to the Examiner's statement that each gas diffusion layer includes a hydrophobic resin, such as polytetrafluoroethylene, as disclosed at column 11, lines 1-10 and carbon fibers, applicants point out that the disclosure at column 11 which the Examiner refers to relates to the formation of a paste which can be used as a catalyst layer. Masuko et al do not disclose at column 11, lines 1-10, that this paste can serve as a gas diffusion layer.

In the Office Action, the Examiner refers to Example 4 of Masuko et al as disclosing a fuel cell electrode having both VGCF and PTFE, wherein the mass ratio of the two is within the broad range of 1 to 95 mass % that is recited in claim 22 of the present application. The Examiner further states that Example 4 of Masuko et al discloses a method of coating a porous substrate with a composition including carbon black powder particles, PTFE resin and VGCF.

It appears that the Examiner has misidentified the Example in Masuko et al which contains a disclosure of a fuel cell electrode having both PTFE and VGCF fibers. Example 4 of Masuko et al does not contain VGCF fibers.

Examples 8-19 of Masuko et al disclose Examples having the combination of VGCF, PTFE and carbon black powder particles, as shown in Table 5-1 of Masuko et al. Table 4 of Masuko et al describes the various VGCF fibers that were employed. It appears to applicants that the Examiner may have intended to refer to Table 4, instead of Example 4.

Applicants note further that at page 4 of the Office Action, at line 3, the sentence beginning with the word "Thus" appears to be incomplete and not understandable.

In view of the above, applicants submit that Masuko et al do not anticipate the above claims and, accordingly, request withdrawal of this rejection.

Claims 19 and 20 have been rejected under 35 U.S.C. § 103(a) as obvious over Masuko et al and further in view of U.S. Patent 5,861,222 to Fischer et al.

In setting forth this rejection, the Examiner, at page 5 of the Office Action, refers to EP '638. Applicants assume that this is a mistake, and the Examiner intended to refer to Masuko et al.

Applicants submit herewith the following statement by undersigned counsel to establish common ownership of the present invention and the subject matter disclosed in the Masuko et al patent, at the time the present invention was made, in order to disqualify the Masuko et al patent as prior art under 35 U.S.C. § 103(a).

The above-identified Application No. 10/049,188 and U.S. Patent 6,780,388 to Masuko et al were, at the time the invention of Application No. 10/049,188 was made, owned by, or subject to an obligation of assignment to, the same person.

In view of the above, applicants submit that U.S. Patent 6,780,388 to Masuko et al cannot be used as a reference under 35 U.S.C. § 103(a) against the present claims.

Applicants note that the newly cited U.S. Patent 6,789,388 to Masuko et al corresponds to WO 2001/092151, a copy of which is attached, which was published on December 6, 2001. The present application claims benefit from U.S. Provisional Application 60/308,855, filed on August 1, 2001, which is before the publication date of WO 2001/092151. Applicants submit that the present claims are entitled to a filing date of August 1, 2001 and that WO 2001/092151, therefore, cannot be used as a reference against the present claims.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the

Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

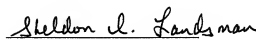
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